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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/645,429	08/21/2003	Robert P. Hepfer	37,241-01	8069

7590 12/02/2004

BP America Inc.
Docket Clerk, BP Legal, M.C. 5East
4101 Winfield Road
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EXAMINER

SACKEY, EBENEZER O

ART UNIT	PAPER NUMBER
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1626

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/645,429

Applicant(s)

HEPFER ET AL.

Examiner

EBENEZER SACKKEY

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 08/21/03
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Status of Claims

Claims 1-16 are pending.

Specification

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Information Disclosure Statement

Receipt of the Information Disclosure Statement filed on 08/21/03 is acknowledged and has been entered into the file. A signed copy of the 1449 is attached herewith.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-13 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for hydrogenation catalysts of Group VIII of the Periodic Table (defined on pages 6 and 7 of the specification), does not reasonably provide enablement for any and all catalysts. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to

make and use the invention commensurate in scope with these claims. A hydrogenation reaction employing any and all catalysts is not properly supported in the specification. The specification fails to adequately teach how to use the invention properly by failing to provide enabling disclosure regarding the above process.

Because of the high level of unpredictability of associated with chemical systems, a greater amount of evidentiary support is needed in order to fully satisfy the requirement of 35 USC 112, first paragraph, that applicants provide sufficient guidance as regards "how to use" the invention. For example, what is encompassed by "catalyst"?

Catalysts encompass a plethora of catalysts and without guidance that is applicable to any and all catalysts, there would be little predictability in performing the claimed invention as evidenced by U.S. Patent number 5,698,749 which discloses that high yields of 1,4-butanediol are obtained when the hydrogenation catalyst comprises at least one noble metal of Group VIII of the Periodic Table and at least one of rhenium, tungsten or molybdenum on a carbon support, wherein the carbon support has been contacted with an oxidizing agent prior to the disposition of the metals. See column 1, lines 1-19.

It is well known that tetrahydrofuran, 1,4-butanediol and gamma-butyrolactone are prepared by catalytic hydrogenation of maleic anhydride, see '749' column 1, lines 21-30 and column 2, lines 1-7. To date, process systems are not entirely free of side reactions, which interfere with the total conversion of raw materials.

Thus, in the absence of a showing of correlation between any and all catalysts claimed as capable of being employed in the instant process, one of ordinary skill in the art is unable to fully predict possible results from claims 1-13 due to the unpredictability

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of catalysts, and since not all catalysts exhibit the same activity. Reciting the Group VIII metals of the Periodic Table as disclosed in the specification would obviate this rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims recite a series of process steps to produce gamma-butyrolactone, 1,4-butanediol and/or tetrahydrofuran from a hydrogenating maleic acid and hydrogen in the presence of a catalyst. It is not clear what conditions have to prevail to produce either gamma-butyrolactone alone or 1,4-butanediol or tetrahydrofuran or a combination of the above. Are **all** the products being produced in equal amounts, and if not what are the ratios or amount of each product?

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

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A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-16 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Patent No. 5,196,602. Although the conflicting claims are not identical, they are not patentably distinct from each other because there are substantial similarities in the instant process thereof claimed in the patent, which has a common inventive entity with the instant application for same uses. Note the hydrogenation of maleic anhydride to produce 1,4-butanediol occurs in two reaction zones. There is also substantial overlap with the remaining process conditions such as temperature in the first stage is between 100° and 350°C, contact time of between 0.1 minutes and 10.0 minutes.

One of ordinary skill in the art would thus have been motivated to hydrogenate maleic anhydride to produce 1,4-butanediol, gamma-butyrolactone and tetrahydrofuran by manipulating process parameters such as temperature and contact time with the reasonable expectation that the resulting product would maintain high yield.

Thus, the instantly claimed process would therefore have been suggested to one of ordinary skill in the art.

Claim Rejections - 35 U.S.C. § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Budge et al., (U.S. Patent number 5,196,602) in view of Bockrath et al., (U.S. Patent number 6,008,384).

Applicants claim a continuous process for producing gamma-butyrolactone, 1,4-butanediol and tetrahydrofuran, comprising (1) hydrogenating maleic acid in the

presence of a catalyst in a first hydrogenation zone to obtain a reaction product comprising succinic acid, (2) hydrogenating the reaction product (succinic acid) in the presence of a catalyst to obtain gamma-butyrolactone, 1,4-butanediol and tetrahydrofuran, wherein the temperature of the first hydrogenation zone is controlled to not to exceed 130°.

Determination of the scope and content of the prior art (MPEP §2141.01)

Budge et al., teach a process for hydrogenating maleic acid to produce 1,4-butanediol which comprises hydrogenating maleic acid in a first reaction zone in the presence of a catalyst to obtain succinic acid and a second hydrogenation in a second reaction zone in the presence of a catalyst to obtain 1,4-butanediol at a temperature range of between 50° and 350°C. See column 1, lines 18-67 and column 4, lines 26-50.

Bockrath et al. teach the hydrogenation of maleic acid to produce tetrahydrofuran, gamma-butyrolactone and 1,4-butanediol in the presence of a hydrogenation catalyst at a preferred temperature range of 130° to 135° C. See column 2, lines 53-67 and column 3, lines 16-26.

Ascertainment of the difference between the prior art and the claims (MPEP §2141.02)

The difference between the instant process and the prior art is that the instant process is drawn to a continuous process with operating temperatures around 130°C, whereas Budge et al., teach a fixed-bed process with a temperature range of 50°C to 350°C. However, Bockrath et al., teach hydrogenation of maleic acid, succinic acid to produce tetrahydrofuran, 1,4-butanediol and gamma-butyrolactone with a preferred temperature range of 130° to 135°C. See column 3, lines 25-26.

Finding of prima facie obviousness---rational and motivation (MPEP §2142-2143)

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Accordingly, one of ordinary skill in the art would be motivated to prepare the instant products by manipulating process parameters such as temperatures with a reasonable expectation that the resulting product(s) would maintain high yield because one would expect the substitution of one process for another, in the instance, continuous for fixed-bed to result in the same product. The courts have consistently ruled that the use of continuous method vs. batch process if no other differences are present, becomes a matter of choice. The advantages of employing a batch process in a continuous manner for manufacturing is conventional in the chemical art. It is evidenced by the 2nd Edition of "Fermentation and Biochemical Engineering Handbook Principles, Process Design, and Equipment", (1997), (for purpose of clarification only), that a batch process seldom is purely batch; a continuous process is purely continuous. It further states that most batch processes require continuous control over one or more variables throughout the entire schedule, and thus the overall batch control system must be a form of hybrid. See *In re Giolito*, 188 USPQ 645 (CCPA 1975); *In re Fong*, 152 USPQ 25, 27 (CCPA 1967) and *In re Lincoln*, 29 CCPA 942, 1942 C.D. 386, 541 O.G. 668, 126 F.2d 477, 53 USPQ 40. Also see MPEP 2144 (V)(E).

Thus, at the time of this invention, one of ordinary skill in the art in possession of Budge et al., and Bockrath et al., is in possession of the instant invention barring a showing of unexpected results and/or properties. The required motivation being the desire to prepare tetrahydrofuran, gamma-butyrolactone and 1,4-butanediol individually or collectively.

Any inquiry concerning this communication or earlier communications from the

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examiner should be directed to E. Sackey whose telephone number is (703) 305-6889.

The examiner can normally be reached on Monday-Friday from 7:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph K. McKane, can be reached on (703) 308-4537. The fax phone number for this Group is (703) 308-4556.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1235.

EOS
November 29, 2004



Joseph K. McKane
Supervisory Patent Examiner
Art Unit 1626, Group 1600
Technology Center 1